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New U.S. Patent Application
Docket No. 32860-000571/US

Claims What is claimed is:

1. A sensor for rapid optical distance measurement based on the a confocal imaging principle, comprising: with
A a light source (110, 210), which adapted to emits an illuminating light (112, 212) with different spectral components;
A an optical imaging system (130, 230), adapted to direct by means of which the illuminating light (112, 212) is directed onto the a surface (240) of a measurement object, with wherein different spectral components of the illuminating light (112, 212) are adapted to being focused at different distances from the optical imaging system (130, 230) due to a chromatic aberration of the optical imaging system (130, 230);
A a beam splitter (120, 220), which is arranged so that the measuring light (152, 252), which is reflected back at least partially from the surface (240), is adapted to be separated spatially from the beam path of the illuminating light (112, 212);
A a light receiver (150, 250), adapted to which detects the measuring light (152, 252) separated spatially from the beam path of the illuminating light (112, 212) with spectral resolution; and
A an analysis unit, which adapted to determines the distance between the sensor (100, 200) and the surface (240) from the intensities of the measuring light (152, 252) detected for different spectral components.
2. Sensor A sensor according to Claim claim 1, with which wherein the measuring light (152, 252) is also fed through the optical imaging system (130, 230).
3. A sSensor according to one of Claims 1 to 2, wherein with which the light source (110, 210) is a white light source.
4. Sensor A sensor according to one of Claims 1 to 3, wherein with which the light re-ceiver (150, 250) is a color camera.
5. Sensor A sensor according to one of Claims 1 to 4, wherein with which

- ~~The light source (110) has~~ includes a plurality of point light sources and
- ~~The light receiver (150) has~~ includes a plurality of point detectors, with
wherein one point detector and one point light source are being associated together and
are with each other and being arranged in a confocal manner in relation to each other.
6. ~~A sensor according to Claim claim 5, with which~~ A sensor according to Claim claim 5, wherein a grating system
with a plu-rality of diffraction gratings is used to provide at least one of the point light
sources and/or the point detectors.
7. ~~Sensor~~ A sensor according to ~~c~~Claim 6, wherein ~~with which~~ the grating
system is at least one of a one-dimensional diffraction grating line ~~or~~ and a two-
dimensional diffraction grating matrix.
8. ~~A sensor according to c~~Claim 6 ~~or 7, wherein~~ A sensor according to cClaim 6 or 7, wherein ~~with which~~ the grating system
also has an arrangement of microlenses.
9. ~~Sensor~~ A sensor according to ~~one of C~~claims 1 to 4, with which ~~further~~
comprising:
-at least one fur-ther optical imaging system (213) is also provided, which is
arranged ~~in such that a way in~~ in the beam path of the illuminating light, (212) ~~that an~~
in-termediate image (225) of the light source (210) is adapted to result s in the an
area be-tween the further optical imaging system (213) and the optical imaging
system (230).
10. ~~Sensor~~ A sensor according to ~~c~~Claim 9, wherein ~~with which~~ a grating system,
including at least one diffraction grating, is arranged in the area of the intermediate
image (225), ~~which has at least one dif fraction grating.~~
11. ~~Sensor~~ A sensor according to ~~Claim claim~~ 10, with which ~~wherein~~
~~The grating system is~~ includes a rotating Nipkow disk (260) and wherein
~~The light receiver (250) is~~ includes (250) is a surface detector.
12. ~~A sensor according to Claim claim 10, with which~~ A sensor according to Claim claim 10, wherein

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the grating system ~~includes~~ has a stationary at least one of a one-dimensional and
two-dimensional diffraction grating matrix and wherein
the light receiver (250) ~~is~~ includes at least one of a one-dimensional and two-
dimensional local resolution surface detector.

13. A sensor according to claim 2, wherein the light source is a white light source.
14. A sensor according to claim 13, wherein the light receiver is a color camera.
15. A sensor according to claim 14, wherein the light source includes a plurality of point light sources and the light receiver includes a plurality of point detectors, wherein one point detector and one point light source are associated together and are arranged in a confocal manner in relation to each other.
16. A sensor according to claim 7, wherein the grating system also has an arrangement of microlenses.
17. A sensor according to claim 15, wherein a grating system with a plurality of diffraction gratings is used to provide at least one of the point light sources and the point detectors.
18. A sensor according to claim 17, wherein the grating system is at least one of a one-dimensional diffraction grating line and a two-dimensional diffraction grating matrix.
19. A sensor according to claim 17, wherein the grating system also has an arrangement of microlenses.
20. A sensor for optical distance determination based on a confocal imaging principle, comprising:
optical imaging means for directing illuminated light onto a surface of a measurement object, and for focusing different spectral components of the illuminated

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- light at different distances from the optical imaging means due to a chromatic aberration of the optical imaging means;
_____ means for spatially separating measuring light, reflected back at least partially from the surface, from a beam path of the illuminated light; and
_____ means for determining the distance between the sensor and the surface from intensities of the measuring light detected for different spectral components.
21. A sensor according to claim 20, wherein the measuring light is also fed through the optical imaging system.
22. A sensor according to claim 20, further comprising means for generating the illuminated light.
23. A sensor according to claim 22, wherein the means for generating includes a white light source.
24. A sensor according to claim 20, further comprising:
_____ means for detecting the light for different spectral components.
25. A sensor according to claim 24, wherein the means for detecting includes a color camera.
26. A sensor according to claim 22, further comprising:
_____ means for detecting the light for different spectral components.
27. A sensor according to claim 26, wherein the means for generating the illuminated light includes a plurality of point light sources and the means for detecting the light includes a plurality of point detectors, wherein one point detector and one point light source are associated together and are arranged in a confocal manner in relation to each other.

28. A sensor according to claim 27, wherein a grating system with a plurality of diffraction gratings is used to provide at least one of the point light sources and the point detectors.
29. A sensor according to claim 28, wherein the grating system is at least one of a one-dimensional diffraction grating line and a two-dimensional diffraction grating matrix.
30. A sensor according to claim 28, wherein the grating system also has an arrangement of microlenses.
31. A sensor according to claim 20, further comprising:
at least one further optical imaging means, arranged for, in the beam path of the illuminating light, producing an intermediate image of the light, in an area between the further optical imaging means and the optical imaging means.
32. A sensor according to claim 31, wherein a grating system, including at least one diffraction grating, is arranged in the area of the intermediate image.
33. A sensor according to claim 32, wherein the grating system includes a rotating Nipkow disk and further comprising means for detecting the light, including a surface detector.
34. A sensor according to claim 32, wherein the grating system includes a stationary at least one of a one-dimensional and two-dimensional diffraction grating matrix and further comprising means for detecting the light, including at least one of a one-dimensional and two-dimensional local resolution surface detector.
35. A method of optical distance determination based on a confocal imaging principle, comprising:
directing illuminated light onto a surface of a measurement object;

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focusing, using an optical imaging device of a sensor, different spectral components of the illuminated light at different distances from the optical imaging device due to a chromatic aberration of the optical imaging device;
_____ spatially separating measuring light, reflected back at least partially from the surface, from a beam path of the illuminated light; and
_____ determining a distance between the sensor and the surface from intensities of the measuring light detected for different spectral components.

36. A sensor for rapid optical distance determination based on a confocal imaging principle, comprising:
_____ a light source, adapted to emit an illuminating light with different spectral components;
_____ an optical imaging system, adapted to direct the illuminating light onto a surface of a measurement object, wherein different spectral components of the illuminating light are adapted to be focused at different distances from the optical imaging system due to a chromatic aberration of the optical imaging system;
_____ a beam splitter, arranged so that the measuring light, reflected back at least partially from the surface, is adapted to be separated spatially from the beam path of the illuminating light; and
_____ an analysis unit, adapted to determine the distance between the sensor and the surface from the intensities of the measuring light detected for different spectral components.